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Your subscription could not be saved. Please try again. 28 emails packed with tips. 8 full cases with solutions (incl. FlashFash). Plus sample case and fit interview videos. When you relay your desire to break into management consulting, a typical quip that can often follow is: “How many golf balls fit in an airplane?”. While most management consulting firms have moved away from these types of questions, they still expect you to confidently and reliably navigate mathematical problems on the fly in case interviews. Regardless of your degree or past experience, you’ll need to be able to perform calculations quickly and accurately, while demonstrating that you understand the overall structure of the problem and the implications of your solution. The good news is that in case interviews, candidates are only required to demonstrate a high-school level of math skills. However, with no calculators allowed and an interviewer looking over their shoulder, many people find this aspect of the interview challenging. This article will walk you through everything you need to know in order to ace case math, including the style of questions you can expect, the skills you’ll need to hone, and how you should prepare. Consultants need to have strong mental arithmetic skills in order to perform key analyses and build credibility with clients. In case interviews, math problems can take the form of straight calculations, exhibits that require calculations, word problems, and estimation questions. To succeed in case math, we recommend following a four-step process of: ‘Verbalize, Calculate, Sense-check, Interpret’. It’s important to keep your work tidy and simple, and to communicate with your interviewer as you work through the problem. While you don’t need advanced knowledge to do well in case interview math, you do need to know the basic operations, key math concepts, and business math. To stand out to your interviewer, you need to work through math problems confidently and efficiently. Keeping track of zeros, simplifying your calculations, and memorizing frequently-used fractions will help you do this. It’s vital to prepare for case math. The Case Math Course – provided as part of our Consulting Interview Prep Toolkit – includes 21 video lectures that cover everything you need to know in detail. Once you’re comfortable with the theory, you can build your skills and confidence quickly with the calculation, case math and market sizing drills in our Consulting Interview Prep Toolkit. You can then practice live cases with other candidates in our Practice Room. You might be wondering why, in an age where you can access a calculator or Microsoft Excel on your phone or laptop in seconds, interviewers still judge applicants on the strength of their mental arithmetic. The rise of Excel and other mathematical modeling software has certainly saved consultants a lot of time and effort in recent years. However, when it comes to interacting with senior executives – where the perception of competence is paramount – mental math is unlikely to ever go out of style. Consultants are often required to calculate values at a moment’s notice. Typical scenarios include being asked to: assess the impact of a proposed cost-saving measure estimate the revenue that a potential new product will generate using orders of magnitude to determine what a set of numbers could mean for the client and the problem at hand In this section, we’re going to address the types of math problems you’re likely to encounter in a case interview. Straight calculations It’s possible that an interviewer will give you a (relatively) straightforward math problem to solve as a standalone question. Usually, however, these calculations take the form of follow-up questions in a larger case study. In a product launch case, the interviewer might ask you to calculate the average price of a product for a company that sells: 10,000 units at $15 per unit through one channel, and 20,000 units at $12 per unit through another channel. You’d need to quickly compute that the average price is (10,000 x $15 + 20,000 x $12) / (10,000 + 20,000) = $13. Consulting charts and exhibits that require calculations There are several types of calculations that your interviewer might propose or ask you to perform based on data in a chart or exhibit. Here’s an example of an exhibit that you might be given in a market entry case: In this example, your interviewer might ask you to identify which city offers the greatest potential market for customers aged 20 to 40. You might then be asked to calculate the percentage difference between the largest and second-largest markets. You could eliminate Hillwood and Bedrock immediately, simply by eyeballing the surface areas of the ‘20 to 30 years’ and ‘30 to 40 years’ segments and noticing that they are the smallest. Then it would be worth computing the values for the remaining three cities, which are more difficult to differentiate visually. You would do this by multiplying the share of their population in the 20-40 age range by their total population, as follows: King’s Landing: (26% + 18%) x 11.4 mn ≈ 5.0 mn Citadel: (60% + 11%) x 5.5 mn ≈ 3.9 mn Metropolis: (20% + 20%) x 13.5 mn ≈ 5.4 mn Metropolis has the largest potential market, with 5.4 million customers aged 20 to 40. This is 8% larger than the potential market of King’s Landing (5.4 / 5.0 = 1.08). Word problems Word problems are another staple of case interviews. They’re likely to be fairly familiar, as you’ll almost certainly have encountered them at some point in your schooling. In the context of a case interview, word problems usually require algebraic calculations. Candidates are expected to extract the most important facts and figures from the word problem, present them in the form of an equation, and then perform the calculations. One common type of word problem that often crops up in case interviews is the ‘breakeven analysis’. This requires candidates to calculate the amount of sales that a company needs to make to recover its costs (i.e. to make neither a profit nor a loss). Let’s say your client is a mid-sized Peruvian copper-mining firm that’s invested $50 million in land purchases, development costs, and equipment. They’ve approached your firm to find out how much copper they need to sell to recoup that investment. In the current market, CopperCollect expects to gross about $10,000 per tonne of copper sold. It costs the firm about $3,000 per tonne to extract, ship, and store the copper. In this scenario, you’d need to divide the firm’s total investment ($50 million) by the gross profit per tonne ($7,000) to find that the mining firm has to sell ~7,200 tonnes of copper to break even. Estimation questions The last type of quantitative question you’re likely to encounter in a case interview is the estimation question (also known as the ‘market sizing’ question). In estimation questions, candidates are required to arrive at a value based on very little upfront data – or sometimes none at all. Here are some examples: How many petrol pumps are there in the UK? What is the annual revenue of a global sandwich chain? What is the size of the market for lattes in the US? How many newspapers are sold in Spain? Estimation questions provide candidates with a good opportunity to demonstrate their ability to make common-sense assumptions and extrapolate a small amount of data using a structured approach. You can learn more about how to do this in our article on nailing market sizing case questions. As with many other aspects of case interviews, there’s a process you can use to structure your thoughts and analysis in case math: 1. Set your approach and describe it Before you begin to solve the problem, tell your interviewer the approach you plan to take. This will both help you to structure your thoughts and allow your interviewer to correct any mistakes or incorrect assumptions you might have made. If your interviewer agrees with your approach, they might indicate that they’re happy to ‘sign off’ on it, either verbally or non-verbally. 2. Calculate The second step is to work through the required calculations correctly, confidently, and quickly. Be sure to write everything down and tell the interviewer what you’re doing, as this will help them to follow along. 3. Sense-check After you’ve completed your calculations, pause for a moment to take a bird’s-eye view of your approach. Does your solution make sense? If you’re trying to assess the yearly revenue of a well-established multinational law firm and your final result is just a few thousand dollars, common sense should tell you that you need to return to your calculations. 4. Interpret Finally, you need to demonstrate to your interviewer that you can glean meaningful and – wherever possible – actionable insights from calculations. Ask yourself whether your solution supports your initial hypothesis. Keep your work tidy and simple Throughout this process, you should write everything down and ensure that your calculations are tidy and simple. Otherwise, you could easily become confused and you’ll be unlikely to impress your interviewer, who will be expecting you to take a professional approach to the exercise. Here are some simple measures that can help you keep your case math work neat and organized: Use a fresh sheet of paper for every problem and non-trivial calculation Write neatly and give yourself ample space on the page Align your ‘equal signs’ on the page to keep your calculations tidy Compute one operation at a time Avoid multiplying percentages together, as this can often lead to errors Look out for when it might be wise to use a table to synthesize different units or types of data Here’s an example of an effective page of case math calculations: Work with your interviewer While it might be tempting to stay silent and then impress your interviewer with the correct answer after performing your calculations, the most successful candidates involve their interviewer in the process. This means you should: get upfront feedback on the approach you plan to take state your assumptions out loud ask the interviewer to provide additional information about certain data sets (although this won’t be appropriate for estimation questions) describe everything you’re doing as you perform your calculations There are many benefits to working with your interviewer in this way. It allows you to react to their verbal or non-verbal feedback in real time. They may even point out errors that you’ll then have the opportunity to correct. It also demonstrates that you have the confidence to collaborate with others on these kinds of problems, and work well in a team. You can see all of this in action in the following video, which shows a candidate working with their interviewer to solve a math problem in a case interview: ▶ To do well in case math, there’s no need for you to learn advanced math or complex corporate finance. Instead, you simply need to master the following types of calculations: Basic operations You learned the four basic operations at school, and they’re pivotal in case interview math. To recap, the basic operations are: addition subtraction multiplication division You might already feel confident that you’ve got the four operations down. However, it’s still an excellent idea to brush up on performing these kinds of calculations – especially with a pen and paper. This video, taken from the Case Math Course, provided as a part of our Consulting Interview Prep Toolkit, walks you through everything you need to know about division for case interviews. ▶ Key math concepts Along with the four basic operations, you’ll also be required to employ many of the following key math concepts in your case math calculations: Fractions Percentages Compounding Weighted averages Probability Algebra Business math As consulting roles focus on improving business performance, it shouldn’t come as a surprise to learn that you’ll probably be tested on business math in a case interview. You’ll need to know how to: interpret financial statements (i.e. income statements, balance sheets, and cash flow reports) make an investment decision value a business optimize operations This video, which is also from our Case Math Course, walks you through everything you need to know about income statements: ▶ The more proficiency and confidence you can demonstrate with math, the more you’ll impress your interviewer. Being able to work through these problems efficiently will also give you more time to work on other aspects of the case. Here are three pro tips that can help you stand out from the crowd: 1) Keeping track of zeros The number-one math mistake we see candidates make in case interviews is miscounting zeros. Case questions often involve large numbers, sometimes in the millions or even billions. Because of this, it’s easy to misplace or inadvertently leave out a zero and render your entire calculation incorrect as a result. Keeping close track of your zeros is therefore crucial. We recommend using one of the following methods to do this: Counting the zeros in your calculation Using scientific notation Assigning letter units to zeros 2) Simplifying your calculations Simplifying your calculations in case interview math will help you to work through the problem with greater speed and efficiency. It will also demonstrate a level of confidence to your interviewer and show that you’re more interested in the essence of the problem than in getting caught up in trivial details. One way of simplifying calculations is by rounding numbers up or down to make them more ‘friendly’. There are typically two opportunities to do this in a case interview: When making assumptions about figures like population numbers When performing calculations, rounding numbers as you go There are a few important points to note when it comes to rounding figures in case interviews. First, check that your interviewer is happy for you to do this. Then, as you progress through the problem, communicate any rounding assumptions you make. Finally, bear in mind that as a rule of thumb, effective rounding shouldn’t change the answer by more than 10%. 3) Memorizing frequently-used fractions Some fraction values are used so frequently in case math that knowing them – along with their percentage value and decimal conversions – can save you significant time. We recommend memorizing the fraction and corresponding percentage and decimal values of 1/2, 1/3, all the way through to 1/10. While case interviews require candidates to demonstrate only a high-school level of math proficiency, you’ll likely need to refresh your skills in this area. Remember that you’ll be performing calculations with a pen and paper, with an interviewer looking over your shoulder. The good news is that we’ve got everything you need to brush up on math theory and then put it to the test. Understanding the theory The dedicated Case Math Course, in our Consulting Interview Prep Toolkit, includes 21 video classes that cover the following areas in detail: The four operations: addition, subtraction, multiplication, and division All the key math concepts you’ll need to master, including fractions, percentages and weighted averages ‘Pro-tips’ for doing well in case math, including keeping track of zeros and simplifying calculations Business math concepts you’ll need to know, including cash flow, investments, and valuations Putting the theory into practice Once you’ve developed a firm grasp of the theory, you can put it into practice with the other resources in the Consulting Interview Prep Toolkit. As mental arithmetic is one of the case interview skills you can practice alone as part of your preparation, we’ve included a comprehensive set of calculation drills in the Toolkit. Drills are interactive exercises that pose rapid-fire questions and then provide instant feedback. When you feel confident with your calculation skills, you can move on to our case math drills and market sizing drills. These allow you to practice all the elements of case math, including requesting missing data, setting an approach to calculating the solution, making reasonable assumptions, and interpreting the results. The final – and most important – stage of case math preparation is practicing live cases with a partner. Most candidates who go on to receive an offer from a top consulting firm like McKinsey, BCG or Bain complete at least 25 live practice sessions before their interview. At CaseCoach, we can connect you with a diverse community of fellow candidates who are all available for case interview practice in our Practice Room. Applications Careers Firms Interview tips Leave a Comment / Case interview / By Sébastien Ritter The truth is you do not need to be an expert mathematician to work as a consultant, still, you will need to do a lot of calculations when working in this field. The math concepts utilized in consulting are not more challenging than those studied from academic math. More exactly, it is different and attempting to solve problems the same way as in school will not be effective. This article will explain to you what makes math so important for aspiring consultants and provide you with some crucial math areas in which you need to be proficient in as well as how to best practice consulting math. Do you need math in consulting or case interviews? Math is omnipresent in case interviews… This industry is known for its complex business problems and challenging strategic decisions, which require a strong foundation in mathematics. Thus, mathematics is a fundamental skill that is essential for success in consulting case interviews. Consulting companies usually use case interviews to test candidates' quantitative skills and problem-solving abilities, which means that proficiency in math is a must-have skill for any aspiring consultant. Candidates who are proficient in math have a significant advantage in the case interview process. They are better equipped to analyze data, create models, and make informed decisions based on quantitative analysis. This is because math skills enable candidates to think logically and analytically, which is crucial in the consulting industry. In addition to helping candidates solve complex business problems, good math skills can also help them to solve the case more efficiently. By quickly identifying the key data points and using mathematical formulas to analyze them, interviewees can save time and leave more time for insightful ideas and recommendations. … because it’s always there in real consulting work Additionally to case interviews, the consulting industry as a whole also places a high value on mathematical ability. Without a strong foundation in math, consultants may struggle to work effectively in their daily duty. Math skills are essential for performing data analysis and modeling, which are crucial aspects of the consulting job. Consulting firms rely heavily on data-driven insights to deliver value to clients, and math skills are necessary to analyze data, identify patterns, and draw meaningful conclusions that can help clients make informed decisions. Secondly, to develop engaging talks and reports that successfully illustrate information and suggestions, solid arithmetic skills are also required. These abilities are essential since clients rely on consultants to provide them with actionable insights that can drive their business forward. By using mathematical formulas and models, consultants can present complex data in a clear and concise manner, making it easier for clients to understand and act upon. Furthermore, math skills are crucial for financial analysis, which is another critical aspect of the consulting job. Consultants must be able to analyze financial data, create financial models, and make informed decisions based on quantitative analysis. This requires a strong foundation in math, including knowledge of statistics, probability, and financial mathematics. 7 Types of math you need in consulting Basic operations (add, subtract, multiply, divide) Definition: Basic math refers to the fundamental arithmetic operations used in mathematics. It includes addition (+), subtraction (-), multiplication (x), and division (/), which are used to perform simple calculations and solve basic math problems. These fundamental arithmetic operations are used in various calculations and are necessary for understanding more advanced math concepts. Basic math is used to calculate various metrics, ratios, and other complex work in consulting as well as case interviews. Without a strong foundation in basic math, it would be challenging to perform such calculations accurately and efficiently. Example: Suppose a consulting project requires calculating the total cost of producing 10,000 units of a product. The cost per unit is $50 for direct materials, $30 for direct labor, and $20 for overhead expenses. To calculate the total cost, we need to use addition and multiplication: Total cost = (Direct materials cost per unit + Direct labor cost per unit + Overhead cost per unit) x Number of units Total cost = ($50 + $30 + $20) x 10,000 = $1,000,000 Ratios and percentages Definition: Ratio is a comparison of two or more quantities, while percentage is a ratio expressed as a fraction of 100. Ratios and percentages are used to express relationships between different variables and are commonly used in finance, statistics, and other fields. Consultants frequently use ratios and percentages to analyze financial statements, assess market share, and evaluate operational performance. Additionally, they evaluate various scenarios and spot shifts over time using this kind of calculation. Example: Suppose a consulting project requires analyzing the profitability of a company. We need to calculate the gross profit margin, which is the ratio of gross profit to revenue expressed as a percentage. If the gross profit is $500,000 and the revenue is $1,000,000, we can calculate the gross profit margin as follows: Gross profit margin = (Gross profit / Revenue) x 100% Gross profit margin = ($500,000 / $1,000,000) x 100% = 50% Management accounting formulas and principles Definition: Accounting math is a set of mathematical principles and methods used in accounting to record, classify, and analyze financial data. It includes the calculation of various financial ratios, such as profit margin, return on investment, and debt-to-equity ratio, which are used to evaluate a company's financial health. Accounting math involves the use of specific formulas and calculations to prepare financial statements, such as balance sheets, income statements, and cash flow statements. Consultants regularly have to use accounting math to interpret financial data, identify areas for improvement, and develop financial models. Common accounting math formulas: Balance Sheet Equation: Assets = Liabilities + Equity Income Statement Equation: Revenue - Expenses = Net Income Gross Margin Ratio = (Revenue - Cost of Goods Sold) / Revenue Debt-to-Equity Ratio = Total Debt / Total Equity Current Ratio = Current Assets / Current Liabilities Example: Suppose a consulting project requires analyzing the financial statements of a company. We need to calculate the current ratio, which is a measure of the company's liquidity. If the current assets are $1,000,000 and the current liabilities are $500,000, we can calculate the current ratio as follows: Current ratio = Current assets / Current liabilities Current ratio = $1,000,000 / $500,000 = 2 Basic finance formulas and principles Definition: Finance math refers to the mathematical principles and methods used in finance to analyze and manage financial data. It includes the calculation of financial ratios, such as return on investment, net present value, and internal rate of return, which are used to evaluate investment opportunities and make financial decisions. Finance math includes advanced financial modeling and analysis techniques, such as discounted cash flow analysis, net present value calculations, and internal rate of return analysis. Consultants will need to use finance math with purposes like evaluate investment opportunities, assess risk, and make strategic recommendations. Common accounting math formulas: Present Value (PV) = Future Value / (1+interest rate)^number of period Future Value (FV) = Present Value x (1+interest rate)^number of period Net Present Value (NPV) = sum of all present values of cash inflows - sum of all present values of cash outflows Internal Rate of Return (IRR) = the interest rate at which the NPV of an investment is zero Return on Investment (ROI) = (Gain from Investment - Cost of Investment) / Cost of Investment Example: Suppose a consulting project requires evaluating investment opportunities. We need to calculate the net present value (NPV) of an investment, which is the difference between the present value of cash inflows and the present value of cash outflows. If the cash inflows for the first year are $50,000 and the cash inflows for the second year are $100,000, and the discount rate is 10%, we can calculate the NPV as follows: NPV = Cash inflow year 1 / (1 + Discount rate)^1 + Cash inflow year 2 / (1 + Discount rate)^2 NPV = $50,000 / (1 + 10%)^1 + $100,000 / (1 + 10%)^2 = $126,456.83 Basic statistics and probabilities Definition: Probability is the branch of mathematics that deals with the study of random events and their likelihood of occurring. It involves calculating the probability of different outcomes based on the available information and using this information to make predictions. Probability is used in consulting to assess the likelihood of different outcomes and events, and to develop risk management strategies. Consultants use probability to analyze market trends, identify potential risks, make forecasts, and develop contingency plans. Example: Suppose a consulting project requires analyzing customer data to identify patterns. We need to calculate the probability of a customer making a purchase given that they have visited the company's website. If the number of website visitors is 10,000 and the number of customers who made a purchase is 500, we can calculate the probability as follows: Probability of purchase given website visit = Number of customers who made a purchase / Number of website visitors Probability of purchase given website visit = 500 / 10,000 = 5% “Weighted” calculations Definition: This is a method of calculating a value based on the weights assigned to different variables. It is commonly used in finance and economics to determine the overall performance of a portfolio, and in other fields to calculate averages of different sets of data. A weighted average is used to calculate the average of a set of numbers, with each number being multiplied by a corresponding weight. This type of math is very useful for consultants since it helps them to analyze financial data, such as revenue growth or customer satisfaction, and to develop performance metrics. Example: Suppose a consulting project requires analyzing survey data. We need to calculate the overall satisfaction score for a product, which is based on ratings for different features. If the ratings for feature A, B, and C are 3, 4, and 5 respectively, and the weights for these features are 30%, 40%, and 30% respectively, we can calculate the overall satisfaction score as follows: Overall satisfaction score = Rating for feature A x Weight for feature A + Rating for feature B x Weight for feature B + Rating for feature C x Weight for feature C Overall satisfaction score = 3 x 0.3 + 4 x 0.4 + 5 x 0.3 = 3.0 Exhibits (chart, tables, diagrams) Definition: An exhibit is a graphical representation (chart) of data that is used to present information in a clear and easily understandable format. It can be used to display trends, patterns, and relationships between different variables, making it a useful tool for visualizing complex data sets. Consultants need to use charts and graphs to present complex data and analysis in a clear and concise manner. They use various types of charts, such as pie charts, bar charts, and line graphs, to convey important information to clients and stakeholders. They also help consultants to identify trends and patterns in data, making it easier to draw meaningful conclusions and make informed suggestions. This part of mathematics is quite diversified since there are numerous types of charts, tables, and diagrams, thus I cannot provide examples for every situation. Learn more at: Six types of chart in case interview Consulting mental math Why is mental math in consulting important? This may also be categorized as a type of mathematics, but I've decided to address it separately to emphasize the significance it is. In the consulting industry, quick math is essential. Although the resulting numbers don't have to be 100% accurate (usually the error margin will be around 5%) , you will have to give a quick result. In many circumstances, there is not a sufficient amount of time to get out a calculator, indeed, they are not even permitted in tests and case interviews. Hence, Mental math is a crucial component of an interview that frequently gets noticed by interviewers when it helps candidates to solve the questions and show their mental agility. When you have become a consultant, mental calculation is even more important since it not only helps us save a ton of time but also builds credibility with people around. You wouldn't want to look sluggish and perplexed in front of your managers, clients or interviewers, would you? How to do mental math for consulting? For our Comprehensive Math Drills, we have developed a methodical approach to mental calculations with large numbers, consisting of two main steps: ESTIMATION and ADJUSTMENT. This method is used for multiplication, division, and percentage. Step 1 - Estimation Simplify the large numbers by taking out the zeroes (e.g. 6,700,000 becomes 6.7 and 000000) Round the resulting 1-to-2-digit numbers for easier calculations (e.g.: 6.7 becomes 7) Step 2 - Adjustment Perform simple calculations with the multiplicands Adjust in the opposite direction of the previous rounding and put the zeroes back in Step 3 - Percentages To do percentages, multiply the original number with the numerator then divide by 100. Detail example: Multiplication: 1,234 x 5,678 Take out zeroes: 12.34 x 56.78 | 00 00 Round: 12 x 60 | 00 00 Calculate: 720 | 0 000 Adjust and add zeros: 7,200,000 (equal down-rounding and up-rounding roughly cancels each other out) Accurate result: 7,006,652 | Error margin: 2.7% Take out zeroes: 85 / 4.5 | 00 / 0 Round: 90 / 4.5 | 00 / 0 Calculate: 20 | 0 Adjust and add zeros: 190 (up-rounding means downward adjustment) Accurate result: 189.09 | Error margin: 0.48% Convert %: 0.7 x 15,940 Take out zeroes: 7 x 15.9 | One 0 in, three 0 out Rounding: 7 x 16 | One 0 in, three 0 out Calculate: 112 | One 0 in, three 0 out Add zeros: 11,200 Adjust : 11,150 (up-rounding means downward adjustment) Accurate result: 11,158 | Error margin: 0.07% For percentage calculations, it is even easier with the “Zeroes management”. We know that the final answer will have roughly the same number of digits as the original 15,940, something like 1x,xxx or x,xxx. So when having 112 after step “Calculate”, we know the final answer would be close to 11,200. Mental Math Tips: Write down numbers: it’s always a good idea to have a visual of the numbers themselves on paper. This makes it 100 times easier, especially with “zeroes management” work. Sanity check: always take a very brief moment to ask yourself “is this result logical?”; if 70% of 15,940 equals 111,500, perhaps something is wrong with your “zeroes management”. Sometimes you can compare the outcome with another obvious data Shortcut percentages: convert percentages into easy, common calculations (e.g.: 33%, 25%, 20% into /3, /4, /5…) if possible. In fact, know as many of these shortcuts as you can. It is better to be long than to be wrong: If your mental math is not good and cannot calculate quickly, do not hesitate to ask for a little more time to get the most accurate answer. Consulting math practice Step 1: Learn about yourself The first step to acing consulting math is to understand yourself, your strengths, your weaknesses and your needs. Assess your current skill level and identify areas where you need to improve. This can be done by reviewing your previous academic performance, past work experiences, and feedback from others. One of the best ways to learn more about the consulting industry and the type of math skills required is to network with those who have experience in this field. They can provide valuable advice and insights on what to expect during tests/interviews and which math skills are most important. This is an extremely important step, but it might be challenging to carry out since many people do not know/have contact with any consultants, former consultants and interviewers. If there are a few people in your network, that's fantastic; if not, you can use our Coaching services to get the most reliable information from current consultants. Step 2: Developing an actionable plan Once you have a clear understanding of yourself, you now need to establish a clear, actionable strategy to improve your consulting math skills. This plan should include a list of resources and activities that will help you promote self-study and focus on the areas that need the most improvement. There are many resources available for consulting math practice, including online courses, textbooks, and practice mental exercise. You may also want to consider hiring a tutor or attending a community to receive personalized guidance and feedback. When developing your plan, it is important to set realistic goals and establish a timeline for achieving them. This will help you stay motivated and track your progress along the way. Step 3: Implement the plan Now that you have a plan in place, it's time to implement it. Set aside dedicated time each day or week to practice your consulting math skills. Consistency is key, so make sure you stick to your schedule and do not skip any practice sessions. When practicing, it is important to focus on understanding the underlying concepts rather than simply memorizing formulas and equations. Work through practice problems step-by-step and identify where you might be making mistakes. Moreover, reviewing your work and seeking feedback from others can help you improve your approach and increase your accuracy. Step 4: Adjust the plan to best suit your capacity Finally, It is crucial to modify your strategy as necessary to accommodate your capabilities. If you find that you are struggling with a particular concept or area, don't be afraid to pivot and adjust your plan accordingly. Consider seeking additional resources or seeking guidance from others who have experience. At the same time, do NOT get too caught up in perfecting every aspect of consulting math is also matter. Recognize your strengths and weaknesses and focus on improving in areas where you can make the most progress. Remember that the goal is not to be perfect but to demonstrate your ability to approach and solve complex problems in a logical and efficient manner. Common math mistakes in consulting Messing up formulas The inability to apply the formula errors or mess up with numbers/signs is a common mistake made by candidates. Anyone may make this error because of both internal factors like mathematical confusion and external factors like time pressure. To avoid this issue, you must first be cautious throughout the procedure, go step-by-step, and carefully examine the data and signs. If you need extra time, kindly request it, keep in mind that the important thing is getting the proper outcome. Secondly, practice using different formulas to solve various problems before the interview. Ensure that you have a clear understanding of when and how to apply each formula. Excess or missing zeroes Another common math mistake is losing units in calculations. When performing calculations, you must keep track of units to ensure that your answer is meaningful and relevant to the context of the problem. Losing units can make your answer meaningless and confusing, which could lead to wrong conclusions. In order to avoid making this error, it's essential to label each step of your calculation and remember to carry the units as you work with them. Keeping your calculations well-organized will prevent you from losing track of the units. Another tip is try to reduce the unit of each metric as much as possible by assigning it to a term. For example, you can write “42,000,000” to “42M”. This will both ease your calculations and avoid confusion, but remember to add the units back to the final result Missing the bigger picture The math done during a consulting case interview serves as a tool, not an end in and of itself. It is crucial to remember that calculations are part of a more significant business problem that you have to solve. Many candidates get wrapped up in calculations, arrive at the correct final number, but forget why they were doing the math and the real purpose of the number they have just found out. To prevent this mistake, remember the significance of the figures you are calculating in the context of your particular business case. One tactic to use is to write the question asked at the top of your sheet before deep diving into your math. As you go through your calculation and as you prepare to present your solution, keep reminding yourself the question you were originally asked and ask yourself if the result you got from your calculation is actually answering it. Then when you explain your answer, do so in a way that clearly shows you understand what your final number means. Share — copy and redistribute the material in any medium or format for any purpose, even commercially. Adapt — remix, transform, and build upon the material for any purpose, even commercially. The licensor cannot revoke these freedoms as long as you follow the license terms. Attribution — You must give appropriate credit , provide a link to the license, and indicate if changes were made . You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. ShareAlike — If you remix, transform, or build upon the material, you must distribute your contributions under the same license as the original. No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits. You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation . No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material. (Article updated 17th October 2024) Today we’re going to give you everything you need in order to breeze through math calculations during your case interviews. Becoming confident with math skills is THE first step that we recommend to candidates like Karthik, who got an offer from McKinsey. And one of the first things you’ll need to know are the 6 core math formulas that are used extensively in case interviews. Let’s dive in! Click here to practice 1-on-1 with MBB ex-interviewers 1. Case interview math formulas 1.1. Must-know math formulas Here’s a summarised list of the most important math formulas that you should really master for your case interviews: If you want to take a moment to learn more about these topics, you can read our in-depth article about finance concepts for case interviews. 1.2. Optional math formulas In addition to the above, you may also want to learn the formulas below. Having an in-depth understanding of the business terms below and their corresponding formulas is NOT required to get offers at McKinsey, BCG, Bain and other firms. But having a rough idea of what they are can be handy. EBITDA = Earnings Before Interest Tax Depreciation and Amortisation EBIDTA is essentially profits with interest, taxes, depreciation and amortisation added back to it. It's useful for comparing companies across industries as it takes out the accounting effects of debt and taxes which vary widely between, say, Meta (little to no debt) and ExxonMobil (tons of debt to finance infrastructure projects). More here. NPV = Net Present Value NPV tells you the current value of one or more future cashflows. For example, if you have the option to receive one of the two following options, then you could use NPV to choose the more profitable option: Option 1: receive $100 in 1 year and $100 in 2 years Option 2: receive $175 in 1 year If we assume that the interest rate is 5% then option 1 turns out to be slightly better. You can learn more about the formula and how it works here. Return on equity = Profits / Shareholder equity Return on equity (ROE) is a measure of financial performance similar to ROI. ROI is usually used for standalone projects while ROE is used for companies. More here. Return on assets = Profits / Total assets Return on assets (ROA) is an alternative measure to ROE and a good indicator of how profitable a company is compared to its total assets. More here. 1.3 Case interview math cheat sheet If you’d like to get a free PDF cheat sheet that summarises the most important formulas and tips from this case interview math guide, just click on the link below. Download free pdf case interview math cheat sheet 2. Case interview math practice questions If you’d like some examples of case interview math questions, then this is the section for you! Doing math calculations is typically just one step in a broader case, and so the most realistic practice is to solve problems within the context of a full case. So, below we’ve compiled a set of math questions that come directly from case interview examples published by McKinsey and Bain. We recommend that you try solving each problem yourself before looking at the solution. Now here’s the first question! 2.1 Payback period - McKinsey case example This is a paraphrased version of question 3 on McKinsey’s Beautify practice case: How long will it take for your client to make back its original investment, given the following data? After the investment, you’ll get 10% incremental revenue You’ll have to invest €50m in IT, €25m in training, €50m in remodeling, and €25m in inventory Annual costs after the initial investment will be €10m The client’s annual revenues are €1.3b Note: take a moment to try solving this problem yourself, then you can get the answer under question 3 on McKinsey’s website. 2.2 Cost reduction - McKinsey case example This is a paraphrased version of question 2 on McKinsey’s Diconsa practice case: How much money in total would families in rural Mexico save per year if they could pick up benefits payments from Diconsa stores? Pick-up currently costs 50 pesos per month for each family If pick-up were available at Diconsa stores, the cost would be reduced by 30% Assume that the population of Mexico is 100m 20% of Mexico’s population is in rural areas, and half of these people receive benefits Assume that all families in Mexico have 4 members Note: take a moment to try solving this problem yourself, then you can get the answer under question 2 on McKinsey’s website. 2.3 Product launch - McKinsey case math example This is a paraphrased version of question 2 on McKinsey’s Electro-Light practice case: What share of the total electrolyte drink market would the client need in order to break even on their new Electro-Light drink product? The target price for Electro-Light is $2 for each 16 oz (1/8th gallon) bottle Electro-Light would require $40m in fixed costs Each bottle of Electro-Light costs $1.90 to produce and deliver The electrolyte drink market makes up 5% of the US sports-drink market The US sports-drink market sells 8b gallons of beverages per year Note: take a moment to try solving this problem yourself, then you can get the answer under question 2 on McKinsey’s website. 2.4 Pricing strategy - McKinsey case math example This is a paraphrased version of question 3 on McKinsey’s Talbot Trucks practice case: What is the highest price Talbot Trucks can charge for their new electric truck, such that the total cost of ownership is equal to diesel trucks? Assume the total cost of ownership for all trucks consists of these 5 components: driver, depreciation, fuel, maintenance, other. A driver costs €3k/month for diesel and electric trucks Diesel trucks and electric trucks have a lifetime of 4 years, and a €0 residual value Diesel trucks use 30 liters of diesel per 100km, and diesel fuel costs €1/liter Electric trucks use 100kWh of energy per 100km, and energy costs €0.15/kWh Annual maintenance is €5k for diesel trucks and €3k for electric trucks Other costs (e.g. insurance, taxes, and tolls) is €10k for diesel trucks and €5k for electric trucks Diesel trucks cost €100k Note: take a moment to try solving this problem yourself, then you can get the answer under question 3 on McKinsey’s website. 2.5 Inclusive hiring - McKinsey case math example This is a paraphrased version of question 3 on McKinsey’s Shops Corporation practice case: How many female managers should be hired next year to reach the goal of 40% female executives in 10 years? There are 300 executives now, and that number will be the same in 10 years 25% of the executives are currently women The career levels at the company (from junior to senior) are as follows: professional, manager, director, executive In the next 5 years, ⅔ of the managers that are hired will become directors. And in years 6-10, ⅓ of those directors will become executives. Assume 50% of the hired managers will leave the company Assume that everything else in the company’s pipeline stays the same after hiring the new managers Note: take a moment to try solving this problem yourself, then you can get the answer under question 3 on McKinsey’s website. 2.6 Breakeven point - Bain case math example This is a paraphrased version of the calculation portion of Bain’s Coffee Shop Co. practice case: How many cups of coffee does a newly opened coffee shop need to sell in the first year in order to break even? The price of coffee will be £3/cup Each cup of coffee costs £1/cup to produce It will cost £245,610 to open the coffee shop It will cost £163,740/year to run the coffee shop Note: take a moment to try solving this problem yourself, then you can get the answer on Bain’s website. 2.7 Driving revenue - Bain case math example This is a paraphrased version of the calculation part of Bain’s FashionCo practice case: Which option (A or B) will drive the most revenue this year? Option A: Rewards program There are 10m total customers The avg. annual spend per person is $100 before any sale (assume sales are evenly distributed throughout the year) Customers will pay a $50 one-time activation fee to join the program 25% of customers will join the rewards program this year Customers who join the rewards program always get 20% off Option B: Intermittent sales There are 10m total customers The avg. annual spend per person is $100 before any sale (assume sales are evenly distributed throughout the year) For 3 months of the year, all products are discounted by 20% During the 3 months of discounts, purchases will increase by 100% Note: take a moment to try solving this problem yourself, then you can get the answer on Bain’s website. 3. Case math apps and tools In the case math problems in the previous section, there were essentially 2 broad steps: Set up the equation Perform the calculations After learning the formulas earlier in this guide, you should be able to manage the first step. But performing the mental math calculations will probably take some more practice. Mental math is a muscle. But for most of us, it’s a muscle you haven’t exercised since high school. As a result, your case interview preparation should include some math training. If you don't remember how to calculate basic additions, substractions, divisions and multiplications without a calculator, that's what you should focus on first. In addition, Khan Academy has also put together some helpful resources. Here are the ones we recommend if you need an in-depth arithmetic refresher: Once you're feeling comfortable with the basics you'll need to regularly exercise your mental math muscle in order to become as fast and accurate as possible. You might want to use some of the following resources. We haven't tested all of them, but some of the candidates we work with have used them in the past and found them helpful. Preplounge's math tool. This web tool is very helpful to practice additions, substractions, multiplications, divisions and percentages. You can both sharpen your precise and estimation math with it. Victor Cheng's math tool. This tool is similar to the Preplounge one, but the user experience is less smooth in our opinion. Mental math cards challenge app (iOS). This mobile app lets you work on your mental math easily on your phone. Don't let the old school graphics deter you from using it. The app itself is actually very good. Mental math games (Android). If you're an Android user this one is a good substitute to the mental math cards challenge one on iOS. 4. Case interview math tips and tricks 4.1. Calculators are often not allowed in case interviews If you weren’t aware of this rule already, then you’ll need to know this: Calculators are not usually allowed in case interviews. This applies to both in-person and virtual case interviews. And that’s why it’s crucial for candidates to practice doing mental math quickly and accurately before attending a case interview. And unfortunately, doing calculations without a calculator can be really slow if you use standard long divisions and multiplications. But there are some tricks and techniques that you can use to simplify calculations and make them easier and faster to solve in your head. That’s what we’re going to cover in the rest of this section. Let’s begin with rounding numbers. 4.2. Round numbers for speed and accuracy The next 5 subsections all cover tips that will help you do mental calculations faster. Here’s an overview of each of these tips: And the first one that we’ll cover here is rounding numbers. The tricky thing about rounding numbers is that if you round them too much you risk: Distorting the final result Or your interviewer telling you to round the numbers less Rounding numbers is more of an art than a science, but in our experience, the following two tips tend to work well: We usually recommend that you avoid rounding numbers by more than +/- 10%. This is a rough rule of thumb but gives good results based on conversations with past candidates. You also need to alternate between rounding up and rounding down so the effects cancel out. For instance, if you're calculating A x B, we would recommend rounding A UP, and rounding B DOWN so the rounding balances out. Note that you won't always be able to round numbers. In addition, even after you round numbers the calculations could still be difficult. So let's go through a few other tips that can help in these situations. 4.3. Abbreviate large numbers Large numbers are difficult to deal with because of all the 0s. To be faster you need to use notations that enable you to get rid of these annoying 0s. We recommend you use labels and the scientific notation if you aren't already doing so. Labels (k, m, b) Use lab

population. 20 million men aged 20-30 * 20% who are really hot = 4 million.I decided to be conservative and assume only 10% of the population my friend thought was attractive would also find her attractive. 10 % of the 4 million hot guys age 20-30 would find her attractive = 400,000.My friend wanted a guy that had a good income, so I decided to focus on people attending or who'd graduated from college. In fact, she was really picky, so I decided to focus on top colleges like the Ivy League schools. About 1% of the U.S. male population attends highly competitive schools like the Ivy League. 400,000 * 1% = 4,000.Finally, I assumed many of the guys who were in the right age range and who my friend found attractive and who found her attractive and who went to a top college might already be taken. I cut the number I'd come up with in half to reflect the highly eligible guys who were already off the market. 4,000 hot, really smart guys age 20-30 / 2 = 2,000.My "so what" based on this analysis was that my friend might want to be a little less picky. All her requirements brought the number of eligible bachelors down from 160 million to only 2,000. But she thought that a group of 2,000 guys was plenty for her to find Mr. Right in, so she decided to keep her standards high. It's hard to do math under the pressure of an interview. These steps are the key to keeping your math accurate.1 – Be clear on what the calculation will tell you.Don't just start doing calculations. Know what business problem you're trying to solve and how your math will give you insight so you can make a decision. Share this with your interviewer.2 – Structure your approach.Before you do any calculation, walk through the steps you'll take to answer the question with your interviewer. There are frequently several steps in consulting math problems.3 – Do the calculation step-by-step.Once you have your approach to the case math problem, do one calculation at a time to ensure accuracy.4 – Explain the "so what?"Don't wrap up your answer with just a number, explain what the number means in the context of the business problem you were trying to solve. What would you recommend to the client?Here's an example of Consulting Math:A manufacturer of high-quality wood outdoor furniture is considering extending its product line to include Adirondack chairs. It only wants to enter the market if it can make at least $5 million a year.Data provided: The size of the North America market for Adirondack chairs is estimated to be $1 billion. The top 4 players hold 20% market share between them. Profit margins average 20%. Now apply the 4-step approach for minimizing mistakes.Be clear on what the calculation will tell you. "I'd like to calculate likely market share and profit our client could expect if it entered the market for Adirondack chairs in order to see if the opportunity is large enough to meet their criteria of $5 million profits."Structure your approach. "To do this calculation, I'd first look at the likely market share our client could achieve based on the share of the top 4 players in the market. Then I'd calculate the revenues that they could expect by multiplying the market share by the size of the market. I'd then use the industry's average profit margin to calculate the level of profit they could expect."Do the calculation step-by-step. "The top 4 players in the market for Adirondack chairs have a combined market share of 20%. 20% market share /4 players = an average market share of 5%. Based on the client's success in the wood outdoor furniture market, we expect they could achieve this level of market share as well."A 5% market share in a market with $1 billion in annual revenue would give the client $1 billion * .05 or $50 million in revenue.$50 million in revenue for a product with a 20% profit margin would give the client $10 million in expected revenue." In some cases, particularly when a case interview math problem is one step in a multi-step case question, an interviewer might hand you a chart with key information on it. These charts often have more pieces of data on them than you need. You need to find the right data. Or, you may need to manipulate the data to find what you need. For example, a table might provide a company's costs and revenues when the information you need is profit margin. Or, it might provide the revenues of the top 4 companies in the market and a 5th number that totals the revenue of all other players in the market, but you might need market share for player #3. Don't let all the number on the chart throw you. You'll still be using the same basic formulas to analyze these numbers. Instead, take a minute to understand the information the chart provides and explain it to your interviewer. Then proceed with the case interview math problem as described above: be clear about what you're looking for in the calculation, walk the interviewer through your approach, do the actual calculation, and then provide the "so what." Using this approach will make interpreting data tables in an interview straightforward.